Available online at www.sciencedirect.com

ScienceDirect

Procedia Computer Science 55 (2015) 1426 – 1431

Procedia Computer Science

Information Technology and Quantitative Management (ITQM 2015)

The Application of Basic-Element Theory on Social Survey Projects of College Students

Yingying Zhou*[1]

Ningbo yinzhou district 899 xueyuan road,Ningbo and 315175,China

Abstract

There is an urgent need to help college students conducting social research regarding how to design questionnaires scientifically and reasonably, how to formulate a research plan, and how to write a high-quality research report. This paper introduces the basic-element theory of extenics into the academic research training of conducting social surveys. Through matter-element analysis, affair-element analysis, and relation element analysis, this paper aims at helping "green hand" college students to fit into their roles and conduct research.

Peer-review under responsibility of the Organizing Committee of ITQM 2015

Keywords: basic-element theory; social research; scientific research of college students; matter-element; affair-element; relation element

Questionnaires have become the majority of social survey projects for college students. For these projects, scientific and reasonable questionnaires help to convey and achieve the research objectives, highlight the key points, obtain better cooperation from the respondents, record and reflect respondents' answers correctly, and provide accurate information. A comprehensive and practical implementation of surveys will contribute to obtaining reliable firsthand data. In addition, a real research report will help to address the problems, and to propose solutions and suggestions to solve the problems.

In an academic training model based on research projects, having selected their research topics, college students need to know how to design questionnaires scientifically and reasonably, how to formulate a research plan, and how to write a high-quality research report. It is necessary to provide college students who have no experience in academic research with working methods for fitting into their roles and conducting project research. This study applied the basic-element theory of extenics to the scientific [1] research training of college students. Through matter-element, affair-element, and relation-element analyses, this paper aims to provide a set of practical methods for designing questionnaires and writing research reports.

* Corresponding author. Tel.: 0086-1348-608-0460.

E-mail address: zhouyydhy@163.com.

Peer-review under responsibility of the Organizing Committee of ITQM 2015
doi:10.1016/j.procs.2015.07.167

1. Introduction of the Basic-Element Theory of Extenics

1.1. Extenics

A team of Chinese scholars led by Cai Wen, a notable scholar and researcher, introduced a new discipline called extenics, which is used to solve incompatible and contradictory problems [1]. Extenics is the study of the extensibility of things and the rules and methods of innovation; it applies all of these to solve contradictory problems. The extenic discipline holds that all the things in the world are extensible and that innovations and strategies for solving contradictory problems can be obtained finally through various transformation methods [2].

The basic theory of extenics is the extension theory; its system is the extension innovative method, and its basic logic is extension logic. The integration of extenics with other fields is called extension engineering.

1.2. Basic-element theory

Extenics holds that all the things in the world are extensible and that the cells for extension are the basic-elements. Matters, affairs, and relations are the three groups for describing the changing world. For the formulation of the description, a formalized system has been established based on the matter-elements, affair-elements, and relation-elements, called basic-elements, which are expressed by triplets of objects, characteristic names, and measures.

2. The Application of Matter-Element Analysis in Designing Questionnaires

A questionnaire is a research instrument that systematically collects information from respondents through a series of questions. Generally, a questionnaire includes the basic information of the respondents and questions to reflect the objectives of the survey. When designing the questionnaire, college students can integrate matter-element analysis into the research questions for their respondents.

2.1. 2.1 Matter-element

Definition 1 We use an ordered triplet

$$M = \left(o_{m,} \quad c_{m,} \quad v_m\right)$$

as the basic element for describing the matter o_m, called the matter-element, where o_m represents the matter; c_m is the characteristic; and v_m is c_m's measure about o_m, where M=(c, v) describes the characteristic of the matter N.

Matter has many different characteristics. As such, an analysis on matter-elements from the perspective of features, functions, performance status, and relations with other matters may lead to different measures.

2.2. Matter-element analysis on respondents

Respondents of the survey are the general social phenomena. According to the model of matter-element description, we assume that the respondents have *n* characteristic names that can be defined as:

$$M = \begin{bmatrix} o_{m,} & c_{m1,} & v_{m1} \\ & c_{m2,} & v_{m2} \\ & \vdots & \vdots \\ & c_{mn,} & v_{mn} \end{bmatrix}$$

Taking “the investigation on college students’ learning adaptability in a university” as an example, college students can be expressed as follows by the matter-element analysis:

$$M = \begin{bmatrix} \text{College students} & \text{Gender} & \text{Male/female} \\ & \text{Age} & \text{18 to 22} \\ & \text{Grade} & \text{1 – 4 grade} \\ & \text{Majors} & \text{Majors} \\ & \text{college} & \text{Seven college} \\ & \text{Political Outlook} & \text{Party members/ League member/gen eral public} \\ & \text{Identification} & \text{Student leaders/ordinary students} \\ & \text{Family} & \text{Single parents/parents/orphans} \\ & \text{Home} & \text{Village/to wn/city} \\ & \text{Family financial status} & \text{Economic wealth/general/poverty} \\ & \text{in/out - province province} & \text{In the province/out of the provincein - province/out - province} \\ & \cdots & \cdots \end{bmatrix}$$

Results from matter-element analysis show that each characteristic corresponds to a question about the respondent of the questionnaire. Whether all the characteristics will be listed on the questionnaire depends on the direct relationship between the respondents and the research questions. Taking age as an example, the ages measure between 18 and 22 years, a factor that can be omitted because of age's lack of influence on learning adaptability.

2.3. Matter-element analysis on survey questions

Survey questions are the core of questionnaire design. Investigation items can be designed on the basis of survey questions. Each survey question can be classified into different large categories, which may include some small items in a detailed classification.

Taking “the investigation on college students’ learning adaptability in a university” as an example, research questions can be expressed as follows by matter-element analysis:

$$M = \begin{bmatrix} \text{Learning adaptability} & \text{Learning environment} & \text{External/i nternal conditions} \\ & \text{Learning motivation} & \text{Direct/indirect/internal/exter nal motivation} \\ & \text{Learning beliefs} & \text{Learning attitude/consciousness} \\ & \text{Study plan} & \text{Formulate/implement/evaluate study plan} \\ & \text{Learning methods} & \text{Have or not/whether applicable} \\ & \text{Teacher's teaching method} & \text{Teaching means/method/attitude/effect} \\ & \text{Classroom learning} & \text{Major class/gene ral class} \\ & \text{Learning efficiency} & \text{Satisfaction evaluation} \\ & \cdots & \cdots \end{bmatrix}$$

Learning adaptability can be classified into large items, including such items as a learning environment, motivation, and belief; these three components of learning adaptability include some small items, such as external and internal conditions. By applying matter-element analysis on the small items, several items will be listed comprehensively and thoroughly for project research reference. The determination of specific items should be based on the research objectives.

Matter-element analysis helps to explore the multi-characteristics of one matter or the multi-measures of one characteristic, which will effectively help college students to clarify respondents, design a questionnaire, and provide a solid foundation for the research that follows.

3. Application of Affair-Element Analysis in the Formulation and Implementation of a Research Plan

On the basis of research objectives, investigation means to formulate a research plan and implement the plan in reality. Affair-element analysis on investigation, which is a typical affair, can help college students to formulate a research plan and to conduct an investigation in reality.

3.1. Affair-element

The interaction between matters is called an affair. It is described by an affair-element.

Definition 2 We use the ordered triplet

$$A = \left(o_{a,} \quad c_{a,} \quad v_a\right)$$

as the basic element for describing an affair, where o_a is the action, c_a, the characteristic name, and v_a is o_a's measure about c_a.

The basic characteristic names of affair-elements include the subjects, objects, times, places, levels, methods, and tools. In general, one action has *n* characteristic names, which are expressed as follows, with *n* as the matter-element:

$$A = \begin{bmatrix} o_{a,} & c_{a1,} & v_{a1} \\ & c_{a2,} & v_{a2} \\ & \vdots & \vdots \\ & c_{an,} & v_{an} \end{bmatrix}$$

3.2. Matter-element analysis on the survey

The survey involves investigation and research. A matter-element analysis on the survey can be expressed as follows:

$$A = \begin{bmatrix} \text{Survey} & \text{Subjects} & \text{Respondents} \\ & \text{Objects} & \text{Surveyor} \\ & \text{Time} & \text{XX Month XX Day XX Year} \\ & \text{Location} & \text{XX university} \\ & \text{Method} & \text{Online survey/live survey} \\ & \text{Quantities Tools} & \text{500 copies} \\ & \text{Tools} & \text{Questionnaire} \\ & \cdots & \cdots \end{bmatrix}$$

The affair-element analysis on the survey can help college students to clarify such items as the respondents, events, locations, quantities, methods, and tools of the survey. An affair-element analysis on the survey is expressed as follows:

$$A=\begin{bmatrix} \text{research} & \text{Subjects} & \text{Questionnaire/data} \\ & \text{Objects} & \text{Researcher} \\ & \text{Time} & \text{XX MonthXX Day XX Year} \\ & \text{Locations} & \text{XX universityl} \\ & \text{Results} & \text{Existing problems/influential factors/suggestions} \\ & \text{Quantities} & 500 \\ & \text{Tools.} & \text{Computer} \\ & \cdots & \cdots \end{bmatrix}$$

Under the condition of clarified respondents and questionnaires, it is easy to formulate a survey plan and to implement the survey according to affair-element analysis.

4. Application of Relation-Element Analysis on Writing a Survey Report

4.1. Relation-element

Extension theory indicates that each matter or affair is related to other matters or affairs and that these relations are interactive and mutually influential with one another. A relation-element is a formulation to describe the relations between matter and matter, affair and affair, and matter and affair.

Definition 3 (relation-element) We used ordered triplets of relation o_r characteristic name c_r, and measure v_r,

$$R=\left(o_{r,} \quad c_{r,} \quad v_r\right)$$

as the basic elements for describing relations, called relation-elements. In general, one relation has many characteristic names, which can be written as follows:

$$R=\begin{bmatrix} o_{r,} & c_{r1} & v_{r1} \\ & c_{r2,} & v_{r2} \\ & \vdots & \vdots \\ & c_{rn} & v_{rn} \end{bmatrix}$$

4.2. Relation-element analysis on a survey report

For conducting research, a survey report is performed through formulating a practical survey plan based on the needs of a society or job. Starting with a clear proposal, we go to the front line of the society, explore new situations and new problems constantly, explore and research consciously, and then write the survey report. A survey report mainly consists of two parts: the first is the study of the scenario, which means to reach reality, to reflect the objective world, to understand things as they are, and to study the data; the second part is research, which analyzes and reveals implied information that is based on the understanding of the objective facts. Therefore, investigation and research form a primary relation directly, which is written as follows:

$$A=\begin{bmatrix} \text{Basic} & \text{Former} & \text{Investigation} \\ & \text{Latter} & \text{research} \end{bmatrix}$$

To write a survey report, we first need to explain the objectives of the survey and the research; then, we explain the problems discovered by the research and finally, we offer recommendations for solutions.

Using matter-element and affair-element analyses, college students can clarify the contents and implementation of the survey. Moreover, they can analyze the influential factors and causes of the problems encountered during the survey. Further, they can propose suggestions to solve the contradictory problems of the existing issues. When solving the contradictory problems and making decisions, it is necessary to clarify the relationships between persons, matters, and affairs. In addition, creative thinking is preferred to coordinate and promote these factors and to achieve goals. Relation-element analysis on the existing problems can help college students to figure out the breakthrough points of the decisions instantly.

Once again, let us take the "survey on the learning adaptability of college students" as an example. On the basis of the previously mentioned matter-element analysis, we can quickly figure out the main relation elements, which include the direct relations between teachers and students, the direct relations between schools and students, the parenthood between parents and students, and the schoolmate relations between students. Through analyzing these relations, it is possible to put forward some measures and suggestions to solve the existing problems on the learning adaptability of college students from the level of schools, parents, teachers, and students.

In extenics, the objective world is a basic-element world. The extension theory describes this world: the real world is a matter-element set or system, the interaction between this set and system constitutes an affair-element set or system, whose mutual-influence makes up the relation-element system. The application of basic-element theory on social survey projects and the academic research training of college students will yield more results with less effort. It will also help the "green hand" college students to fit in their roles and conduct research.

References

[1] Wen, C., Chunyan, Y., Guanghua, W. Extenics. *Chinese Science Foundation* 2004:**5**:268–272.

[2] Zhenhua, G. Extenics Theory and Application. .*Baoji University (Natural Science Edition)* 2014:**2**:1–5.

[3] Chunyan, Y., Wein, C., *Extenics Engineering*, Beijing Science Press, 2007.

[4] Wen, C. *Innovation Revolution*. Science Press, 2010.

[5] Wen, C. Extenics combination and incompatible problems. *Science Exploration Journal* 1983:1:83–97.

[6] Wen, C. Application of Extenics.. *Science Journal* 1999:**447**:673–682.